REMARKS

Claims 1, 22 and 24 have been amended to clarify that a complete *mixed* oxide film is formed in the claimed methods. In addition, new Claims 34 and 35 have been added, as discussed in detail below. No new matter is added by these amendments and new claims. Claim 25 was cancelled in the January 23, 2006 response to the Final Office Action. Accordingly, Claims 1-24 and 26-35 will be pending after entry of the present amendments.

New Claims

New Claims 34 and 35 have been added to explicitly indicate that in Claim 1 the substrate can be contacted with the vapor phase silicon compound multiple times in each deposition cycle and that in Claim 22 pulsing the vapor phase silicon compound and pulsing the first reactive vapor phase oxygen source can be repeated multiple times in each cycle. As disclosed in the specification, for example at paragraphs [0041], [0042], [0046] and [0047] of the application as published, the ratio of the amount of silicon oxide to metal oxide can be varied to produce mixed oxides with a desired composition. Thus, in each complete deposition cycle for producing a mixed oxide, the number of silicon oxide deposition cycles and the number of metal oxide deposition cycles can be varied. Consistent with this, Claim 1 recites a deposition cycle comprising contacting the substrate with both a silicon compound and a metal compound and Claim 22 recites a deposition cycle comprising pulsing a silicon compound, a first oxygen source, a metal compound and a second oxygen source. As Claims 34 and 35 reinforce and make clear, the number of silicon, metal and oxygen pulses in each multicomponent oxide deposition cycle can be varied.

Claim Rejections Under 35 U.S.C. 103(a)

Claims 1-9, 11-18 and 21-33 are rejected under 35 U.S.C. §103(a) as being unpatentable over "Surface Chemistry for Atomic Layer Growth" by George et al. ("George") in view of U.S. Patent Nos. 6,015,590 to Suntola et al. ("Suntola") and 6,313,035 to Sandhu et al ("Sandhu"). The Examiner has found that George teaches all of the limitations of Claims 1-9, 11-18 and 21-33 with the exception of "a multicomponent thin film comprising silicon and a transition metal." In meeting this deficiency, the Examiner asserts that Sandhu teaches a multi component layer

comprising a metal oxide and a silicon oxide and that the layer may be deposited by CVD "and may also be deposited by other processes." The Examiner concludes that one of skill in the art would have found it obvious to modify George to deposit silicon oxide and a metal oxide because Sandhu teaches the utility of a multi component oxide.

Applicants respectfully submit that there is no motivation for the combination of George and Sandhu and that such a combination would not produce a multi component mixed oxide. Sandhu is entirely concerned with CVD reactions. There is no teaching or suggestion in the Sandhu reference, either in the abstract or elsewhere, that atomic layer deposition (ALD) could be used to form multi-component oxides. While the abstract does include the phrase "the multi-component layer may also be deposited using other processes," this phrase must be taken in the context of the *entire sentence* and the entire disclosure. The complete sentence states: "The multi-component layer may also be deposited using other processes, ***such as radiant energy or rapid thermal CVD***." Thus, one of skill in the art would understand that this reference to "other processes" is a reference to other *CVD processes*. Consistent with this, the remainder of the disclosure in Sandhu is focused on CVD processes and does not mention ALD.

As is well-known in the art, CVD and ALD work on entirely different bases. As a result, they are not considered to be interchangeable. As Sandhu discloses at column 7, lines 45-48, in their CVD reactions the reactants are *intermixed* and react to deposit a titanium silicon oxide film on heated substrates. In contrast, in ALD the reactants are provided separately and there is no intermixing. Further, ALD depends upon the nature of the particular precursors. In Sandhu, there is no suggestion that their CVD process could be modified to work by ALD, no suggestion of how such a modification could be successfully implanted or even that anything other than a CVD process could be used to form multicomponent oxides. Thus, Sandhu provides no motivation to combine their CVD teachings with the ALD teachings of George.

In addition, as the Examiner has recognized, "George does not disclose a multicomponent thin film comprising silicon and a transition metal." George only discloses deposition of single, binary oxides and has no recognition that mixed oxides could be formed by ALD. As a result, George has no teaching or suggestion that would motivate one of skill in the art to attempt to make multicomponent mixed oxide films and thus George would not provide one of skill in the art with any motivation to combine its teachings with those of Sandhu.

Further, neither reference provides any teaching or suggestion of how one would modify the teachings of George and Sandhu to deposit a mixed oxide by ALD. Again, George is only concerned with depositing binary oxides. While George mentions superlattices, this does not teach or suggest *mixed* oxides as claimed. Sandhu discloses only CVD processes and has no teaching or suggestion of how an ALD process could be modified to deposit a mixed oxide. Thus, there is no teaching or suggestion in either reference of how an ALD process could be used to deposit a mixed oxide. As a result, there is not only a lack of motivation for the combination, but the combination actually fails to teach each element of the claimed methods as required to establish a prime facie case of obviousness.

Finally, even if the combination of Sandhu, George and Suntola established a prima facie case of obviousness, which Applicants contend it does not, the prima facie case would be rebutted by the unexpected results obtained by the Applicants using the claimed methods. As disclosed in the specification at paragraph [0017] and [0048] of the application as published, the growth rate observed for a multicomponent oxide is much higher than that of either individual oxide from which the multicomponent oxide is formed. As a particular example, the specification teaches that the growth rates of both of the multicomponent mixed oxides lanthanum silicon oxide and yttrium silicon oxide are more than three times the growth rate of the individual components. This increase in the growth rate of the multicomponent oxides compared to the individual oxides was unexpected and confers particular advantages on the claimed methods, such as faster processing time.

In view of the lack of motivation to combine the George and Sundhu references, the lack of teaching or suggestion of how to modify the references to arrive at the claimed methods, and the unexpected results, Applicants respectfully submit that the rejections under 35 U.S.C. §103 should be withdrawn.

Conclusion

In view of the arguments presented above, Applicants submit that the present application is in condition for allowance and respectfully request the same. If any issues remain the Examiner is cordially invited to contact Applicants' representative at the number provided below in order to resolve such issues promptly.

Respectfully submitted,

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